

CLAIMS

1. A light beam scanning apparatus comprising:  
light beam emitting means for outputting a light  
beam;

5 a beam scanner for reflecting the light beam  
output from said light beam emitting device towards a  
to-be-scanned surface to scan the to-be-scanned surface  
by use of the light beam in a main scanning direction;

10 a first beam position detector for detecting the  
light beam scanned on the to-be-scanned surface by said  
beam scanner and generating an analog signal which is  
continuously changed with a variation in the passage  
position in a sub-scanning direction perpendicular to  
the main scanning direction of the light beam; and

15 a controller for controlling the position of the  
light beam scanned by said beam scanner on the to-be-  
scanned surface to a preset position based on the  
result of detection of said first beam position  
detector.

20 2. The light beam scanning apparatus according  
to claim 1, in which said light beam emitting means  
includes a plurality of light beam emitting devices and  
said beam scanner scans the to-be-scanned surface by  
use of a plurality of light beams emitted from said  
25 plurality of light beam emitting devices and which  
further comprises light beam passage position changing  
means of a number smaller than the number of said

10067868.020802

plurality of light beam emitting devices by one, for  
changing the passage position of the light beam in the  
sub-scanning direction; said controller determining one  
of the plurality of light beams as a reference beam and  
5 changing the relative passage position of the remaining  
light beams with respect to the passage position of the  
reference light beam by use of said light beam passage  
position changing means.

3. The apparatus according to claim 1, which  
10 further comprises a second beam position detector  
arranged on the upstream side in the main scanning  
direction of the light beam with respect to said first  
beam position detector, for detecting the passage of  
the light beam scanned by said beam scanner and  
15 generating a timing signal; and integrating means for  
integrating the output of said first beam position  
detector in response to the timing signal from said  
second beam position detector; and in which said  
controller controls the passage position of the light  
20 beam to a preset position based on the result of  
integration of said integrating means.

4. The apparatus according to claim 1, which  
further comprises:

a second beam position detector arranged on the  
25 upstream side in the main scanning direction of the  
light beam with respect to said first beam position  
detector, for detecting the passage of the light beam

scanned by said beam scanner and generating a first timing signal;

5 a third beam position detector arranged on the downstream side in the main scanning direction of the light beam with respect to said first beam position detector, for detecting the passage of the light beam scanned by said beam scanner and generating a second timing signal;

10 integrating means for integrating the output of said first beam position detector in response to the first timing signal from said second beam position detector; and

15 converting means for converting the result of integration by said integrating means from an analog signal to a digital signal in response to the second timing signal from said third beam position detector; and in which

20 said controller controls the passage position of the light beam to a preset position based on the digital signal converted by said converting means.

5. The apparatus according to claim 1, wherein said first beam position detector includes second and third beam position detectors;

25 said second beam position detector generates an output which continuously decreases with a variation in the passage position of the light beam in the sub-scanning direction,

10057868-020802

said third beam position detector is disposed separately from said second beam position detector in the sub-scanning direction and generates an output which continuously increases with a variation in the passage position of the light beam, and

said controller controls the passage position of the light beam to a preset position based on the results of detection of said second and third beam position detectors.

6. The apparatus according to claim 5, in which said light beam emitting means includes a plurality of light beam emitting devices and said beam scanner scans the to-be-scanned surface by use of a plurality of light beams emitted from said plurality of light beam emitting devices, and which further comprises:

light beam passage position changing means for changing the passage position of at least one of the plurality of light beams;

a fourth beam position detector having a plurality of light detecting sections arranged in a row in the sub-scanning direction between said second and third beam position detector, for detecting a plurality of light beams scanned by said beam scanner, a target passage position being set in a mid portion between every adjacent two of said light detecting sections;

beam selecting means for selectively causing one of said plurality of light beam emitting devices to

1.00671868.020802

emit light;

a second controller for controlling the passage position of the light beam based on the result of detection of said second and third beam position detectors by use of said light beam passage position changing means to permit one of the light beams scanned by said beam scanner to scan said fourth beam position detector; and

a third controller for controlling the passage position of the light beam based on the result of detection of said fourth beam position detector by use of said light beam passage position changing means to permit the light beam whose passage position is changed by said second controller to pass through one of the target passage positions.

7. The apparatus according to claim 6, further comprising:

a fifth beam position detector disposed separately from said second and third beam position detectors in the main scanning direction, for detecting the light beam used for scanning the to-be-scanned surface by said beam scanner and generating an output which continuously decreases with a variation in the passage position of the light beam;

a sixth beam position detector disposed adjacent to said fifth beam position detector in the sub-scanning direction, for detecting the light beam used

for scanning the to-be-scanned surface by said beam scanner and generating an output which continuously increases with a variation in the passage position of the light beam; and

5           inclination detecting means for detecting whole inclinations of said second to sixth beam position detectors with respect to the scanning direction of the light beam based on the results of detection of said second, third, fifth and sixth beam position detectors.

10           8. A light beam scanning apparatus comprising:  
          a plurality of light beam emitting devices for outputting light beams;

          a beam scanner for reflecting the light beams output from said light beam emitting devices towards a  
15       to-be-scanned surface to scan the to-be-scanned surface by use of the light beams in a main scanning direction;

          a first beam position detector for detecting the light beam scanned on the to-be-scanned surface by said beam scanner and generating an analog signal which is  
20       continuously changed with a variation in the passage position in a sub-scanning direction perpendicular to the main scanning direction of the light beam;

          a first target light detecting member having a first passage target and disposed separately from said  
25       first beam position detector in the main scanning direction;

          a second target light detecting member having a

20250220 09082900T

second passage target separated from the first passage target in the sub-scanning direction by a distance corresponding to preset resolution;

light beam passage position changing means for  
5 changing the passage position of at least one of the plurality of light beams; and

a controller for controlling the relation of the respective passage positions of the plurality of light beams to a preset relation by use of said light beam  
10 passage position changing means based on the outputs of said first beam position detector respectively obtained when the light beam has passed through the first and second passage targets.

9. The apparatus according to claim 8, wherein  
15 said controller includes:

calculating means for calculating a difference between the outputs of said first beam position detector respectively obtained when the light beam has passed through the first and second passage targets;  
20 and

means for changing the passage position of one of first and second light beams among the plurality of light beams by use of said beam passage position changing means to set the difference calculated by  
25 said calculating means equal to a difference between outputs of said first beam position detector respectively obtained at the time of scanning by the

20067866-020802

first and second light beams.

10. The apparatus according to claim 9, which further comprises:

5 a third target light detecting member having a third passage target and disposed separately from said first beam position detector in the main scanning direction; and

10 a fourth target light detecting member having a fourth passage target separated from the third passage target in the sub-scanning direction by a distance corresponding to second resolution; and in which

15 said calculating means calculates a difference between the outputs of said first beam position detector respectively obtained when the light beam has passed through the third and fourth passage targets and said changing means controls said beam passage position changing means to set the difference calculated by said calculating means equal to a difference between outputs of said beam position detector respectively obtained at  
20 the time of scanning by the first and second light beams among the plurality of light beams.

11. The apparatus according to claim 8, wherein said controller includes means for calculating an output variation rate with respect to a variation  
25 in the passage position of the light beam of said [first] beam position detector based on the outputs of said [first] beam position detector respectively obtained when

10067868.020302



the light beam has passed through the first and second light passage targets; and means for controlling the passage positions of the plurality of light beams based on the variation rate.

5           12. A light beam scanning apparatus comprising:

          a plurality of light beam emitting devices for outputting light beams;

          a beam scanner for reflecting a plurality of light beams output from said plurality of light beam emitting devices towards a to-be-scanned surface to scan the  
10           to-be-scanned surface by use of the plurality of light beam;

          a first beam position detector for detecting the light beam scanned on the to-be-scanned surface by said  
15           beam scanner and generating an output which is continuously changed with a variation in the passage position of the light beam in a sub-scanning direction perpendicular to a main scanning direction of the light beam;

20           a second beam position detector disposed separately from said first beam position detector in the main scanning direction and having a width in the main scanning direction which is equal to a traveling distance of the light beam on said first beam position  
25           detector passed when the light beam scans the first passage position;

          a third beam position detector disposed separately

10067858-020802

from said first beam position detector in the main scanning direction and having a width in the main scanning direction which is equal to a traveling distance of the light beam on said first beam position detector passed when the light beam scans the second passage position, the second passage position being separated from the first passage position in the sub-scanning direction by a distance corresponding to preset resolution;

10           light beam passage position changing means for changing the passage position of at least one of the plurality of light beams; and

          a controller for controlling the passage positions of the plurality of light beams to a preset position by use of said light beam passage position changing means based on the outputs of said second and third beam position detector respectively obtained when the light beam has passed through said second and third beam position detector.

20           13. The apparatus according to claim 12, wherein said controller includes:

          calculating means for calculating a difference between the outputs of said second and third beam position detector respectively obtained when the light beam has passed through said second and third beam position detector; and

          means for changing the passage position of one

10067868-020802

of first and second light beams among the plurality  
of light beams by use of said first beam passage  
position changing means to set the difference  
calculated by said calculating means equal to a  
5 difference between outputs of said beam position  
detector respectively obtained at the time of scanning  
by the first and second light beams.

14. The apparatus according to claim 13, which  
further comprises fourth beam position detector  
10 disposed separately from said first beam position  
detector in the main scanning direction and having  
a width in the main scanning direction which is equal  
to a traveling distance of the light beam on said first  
beam position detector passed when the light beam scans  
15 the third passage position, the third passage position  
being separated from the first passage position in the  
sub-scanning direction by a distance corresponding to  
second resolution; and in which

said calculating means calculates a difference  
20 between the outputs of said second and fourth beam  
position detector respectively obtained when the light  
beam has passed through said second and fourth beam  
position detector, and

said changing means changes the passage position  
25 of one of the first and second light beams by use of  
said beam passage position changing means to set the  
difference between the outputs of said second and

10067868 "020802"

fourth beam position detector equal to a difference  
between outputs of said first beam position detector  
respectively obtained at the time of scanning by the  
first and second light beams among the plurality of  
5 light beams.

15. The apparatus according to claim 12, wherein  
said controller includes:

calculating means for calculating an output  
variation rate with respect to a variation in the  
10 passage position of the light beam of said first beam  
position detector based on the outputs of said second  
and third beam position detector respectively obtained  
when the light beam has passed through the second and  
third beam position detector; and

15 means for changing the passage positions of the  
plurality of light beams based on the output variation  
rate by use of said beam passage position changing  
means.

16. An image forming apparatus comprising:

20 light beam emitting means for outputting a light  
beam according to an image data;

a beam scanner for reflecting the light beam  
output from said light beam emitting devices towards an  
image forming medium to scan the image forming medium  
25 by use of the light beam in a main scanning direction  
for forming an image on the image forming medium  
according to the image data;

a beam position detector for detecting the light  
beam scanned on the image forming medium by said beam  
scanner and generating an analog signal which is  
continuously changed with a variation in the passage  
5 position in a sub-scanning direction perpendicular to  
the main scanning direction of the light beam; and

a controller for controlling the scanning position  
of the light beam scanned by said beam scanner on the  
image forming medium to a preset position based on the  
10 result of detection of said beam position detector.

10067858.020802